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Effectiveness of Therapeutic Horseback Riding on Autism Symptoms

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Abstract

This study investigated the effectiveness of Therapeutic Horseback Riding on Autism Symptoms. Twenty children ranging from 8 to 15 years of age with a diagnosis of Autism Spectrum Disorder (ASD) participated in this study. For 12 weeks, all participants received therapeutic riding session once weekly. The Gilliam Autism Rating Scale test was conducted pre- and post-intervention to establish overall change in ASD severity. According to the results of the present study, it can be inferred that the intervention significantly reduces the symptoms of autism (stereotypical behaviour) in the experimental group. The results provide evidence that therapeutic horseback riding may be an effective treatment for children with ASD.

Keywords: Autism, Therapeutic horseback riding, Stereotypical behavior

1. Introduction

Autism is a developmental disorder characterized by deficits involving communication, social interactions and restricted or repetitive behaviors [1]. Worldwide, the prevalence of autism has been reported to be approximately 1%, with a female-to-male ratio 1:4 [2]. Over the last few decades, various therapy methods have been suggested to improve the symptoms related to Autism Spectrum Disorder (ASD). Current therapy methods contain language and speech therapy [3], applied behavior analysis (ABA) [4], and occupational therapy [5]. A therapy method that is gaining attention in health care is animal assisted therapy.

Recently, animal-assisted therapy (AAT) is known as an effective treatment for developmental disabling disorders. Using animals as a complementary or alternative type of therapy for goal-oriented treatment sessions is defined as AAT. The AAT can result in positive modifications in the health and behaviour of the patient and can be significantly beneficial in psychological, social, and cognitive domains [6]. Studies also suggest that the AAT can be an appropriate treatment for decreasing blood pressure, anxiety level, depression, and heart rates, as well as increasing self-esteem and social interaction [7]. Among the AAT methods of treatment, therapeutic horseback riding became popular for children with autism [8].

Therapeutic horseback riding is a form of equine-oriented therapy which refers to the use of horse in order to improve balance, mobility, and posture of the rider by developing a therapeutic bond between the horse and patient at the meantime. Therapeutic horseback riding affects cognitive, psychosocial, and physical functioning domains of children with neurological disorders [9].

Literature review indicates few studies for the effect of therapeutic horseback riding on autism. For example, the study was designed to examine the impact of therapeutic horseback riding on social functioning of children with ASD [10]. The effect of therapeutic horseback riding on communication and social interaction skills of children with autism was investigated in [11]. Another study investigated the effect of therapeutic horseback riding on socialization, self-regulation, adaptive, and communication in children with ASD [12]. The other study was designed to examine the impact of therapeutic horseback riding on cognition and language in children with autism [13].

However, effectiveness of therapeutic horseback riding on autism symptoms like stereotypical behaviour is not investigated by the existing studies. Stereotypical behaviour contains object use (e.g., flipping objects, lining up toys), repetitive vocal responses (e.g., scripting, echolalia, idiosyncratic

phrases), as well as repetitive motor movements (e.g., hand-flapping), which are important symptoms of autism children [14].

This study examined the impacts of a 12-week therapeutic horseback riding intervention on symptoms of children with autism. We hypothesized that children exposed to therapeutic riding exercises would exhibit improvements in stereotypical behaviour compared to participants who did not receive the treatment.

2. Method

Twenty children diagnosed with ASD participated in this study at Etminan Equestrian Training Centre. Participants were recruited from the Pishgaman Omid Bakhtar Autism center in Urmia, Iran. All participants met criteria for DSM-IV-TR (American Psychiatric Association 2000) autism spectrum diagnosis. Parents had to consent to pre-testing, 12 weeks of therapeutic horseback riding, and one post testing session. Selected participants had no previous experience to horseback riding activities.

Participants were divided into two groups. Ten participants were randomly assigned to be the experimental group, in which a therapeutic horseback riding program was implemented as the intervention group. The other ten children participated in regular activities as the control group.

Once participants had obtained medical approval from their doctors, they were randomly assigned to either the experimental or control group. The experimental group consisted of 10 boys ranging from 8 to 15 years, while the control group was made up of 10 boys ranging from 8 to 15 years.

All pre-test measurements were given to parents in both the experimental and control group before the intervention sessions were initiated. Post-test assessment was accomplished of both groups after the completion of the 12 weeks intervention.

2.1.Measures

The Gilliam Autism Rating Scale (GARS) test is a checklist that assists to identify people with autism [15]. The GARS test was standardized in 1994, which identifies subjects related to autism on a sample of 1092 people from 46 states including Columbia, Puerto Rico, and Canada [16]. This test is based on the Diagnostic Manual of Psychiatric Disorders and is provided according to definition of the Autism Society of America [17] and the American Psychiatric Association [18].

The GARS test includes four subscales in which each subscale consists of 14 items. Stereotypical behaviour (items 1 to 14) is the first subscale, and it describes cases of motor disorders, stereotypical behaviour, and strange behaviours. Communication (items 15 to 28) is the second subscale. This subscale describes the symptoms of autism known as verbal and nonverbal behaviours. Social interaction (items 29 to 42) is the third subscale. Finally, developmental disorder (items 43 to 56) is the fourth subscale [15].

In GARS test, the internal consistency of each subscale is specified via Cronbach’s coefficient alpha, 90% for stereotypical behaviours, 89% for communication, 93% for social interaction, and 88% for developmental disorders. Using the GARS test, not only the reliability of test-re-test method is reported, more importantly the reliability of the scorecards is provided [15].

Ahmadi et al [19] validated the GARS test in Iran. In their study, 100 people were participated with autism in Isfahan, Iran. They exhibited that the reliability of the GARS test based on Cronbach's alpha in different subscales including stereotypical behavior, communication, social interaction, and developmental disorder issues were 74%, 92%, 73%, and 80%, respectively, with an average of α = 89%. The simultaneous validity of the GARS test was also measured by Childhood Autism Rating Scale (CARS) test [20]. In [20], it was shown that correlation coefficient of the subscales of stereotypical behavior, communication, social interactions and developmental disorder issues with CARS test were 84%, 63%, 48%, and 54%, respectively, which resulted in a total correlation coefficient of GARS and CARS tests equal to 80%.

2.2. Procedure

The administrative staff at the Etminan Equestrian Training Centre (EETC) was responsible for administering all informed consent forms. Each child in the treatment group received a therapeutic riding session for 1 hr per week over the span of 12 weeks. Four sessions were rescheduled because of poor weather conditions. Although horse assignments were initially randomized, some adjustments were made based on the size and weight of the participant. The following sessions were established during the therapeutic riding period.

2.2.1. Mounting/Dismounting

The trained EETC instructors assisted the participants in mounting and dismounting their horse. All the processes were verbalized to participants using step-by step instructions. The mounting/dismounting session of the program lasted 5 min and was aimed at stimulating vestibular processing, verbal communication, and proprioception.

2.2.2. Exercises

When mounting the horse was successfully done, the participants performed at least 15 min of warm-up exercises to stretch their bodies in preparation of the riding class. The participants routinely performed a series of the following exercises: trunk twists, arm circles (backward and forward), and opposite toe touches. Through the direction of the riding instructors, the trained side walkers provided the riders verbal, modeling and/or physical prompts as needed to assist them in acquisition of these designated exercises.

2.2.3. Riding Skills

After the exercises, the participants were trained for 20 min of riding skills at each session. These riding skills were specifically adopted to stimulate fine and gross motor domains, as well as sensory seeking. All the participants were instructed to perform the following skills: open guided rein, two-point, direct rein, use of proper riding aids (seat, voice, leg, and hand), upward and downward transitions (halt/walk, walk/halt), as well as posting at the walk. These activities sought to target coordination and balance.

Once participants trained to halt and walk on their horse, the instructor asked them to verbalize the command at the same time. For those participants who were nonverbal, the volunteers and instructor prompted participants to use basic sign language in order to show they figured out the command, i.e., palms down, place hands side-by-side, and move each hand up and down to request the horse to walk forward. This session of the intervention was designed to improve planning and spatial reasoning.

2.2.4. Horsemanship Activities

As the last part of the horsemanship session, the participants took part in grooming activities for 20 min. Children trained how to properly care and groom their horses by learning to identify grooming tools (body brush, curry comb, face brush, mane/tail comb, hoof pick, etc.) and bathing tools (water, shampoo, sweat scraper, bucket, sponge, etc.). Participants were also trained to learn which organ of the horse body was most closely associated with human anatomy. Participants were asked to verbally express or point to the analogous part. Throughout each of the 1 hr sessions, participants were verbally and physically reinforced (e.g., by high-fives and hugs) upon completion of each exercise. During the therapy session, the volunteers and instructors took efforts to maintain eye contact with all participants.

3. Data Analysis

The obtained data of this study were analyzed using inferential statistics such as multivariate analysis of variance test and covariance analysis. The SPSS software version 21 was used to analyze the data.

Findings

The covariance analysis method was used to examine the main hypothesis of this study (effect of horseback riding on ASD) and also to compare the autism symptoms after controlling the pre-test in two groups based on mean scores of post-tests. Some assumptions are required to implement this test,

like the linearity of the relationship between variables, the normal distribution of variables, equality of variances (P = 0.053, F = 4.36), and regression slope homogeneity (P = 0.471, F = 0.54). These assumptions approved the allowance for implementation of covariance analysis. Table 1 reports the mean and standard deviations of autism symptoms scores in the control and experimental groups in the pre-test and post-test phases. In addition, Table 2 presents the results of this analysis, which were based on the total score of the symptoms of autism in the subjects of the experimental and control groups. As illustrated in Table 2, there is a significant difference between the means of post-test autism symptoms after the control of pre-test (F = 132.93, P = 0.001). Figure 1 demonstrates the comparison of control and experimental groups for the mean score of post-test phase. It is obvious that the mean score of post-test phase for the experimental group is significantly lower than that of control group (the mean score of the control group is almost 0.97; however, the mean score of the control group is 0.78). In other words, it can be inferred that the research hypothesis is confirmed since the intervention significantly reduced the symptoms of autism in the experimental group in the post-test phase. In addition to the above analysis, the effectiveness of intervention in the components of autism symptoms in the post-test phase was evaluated using multivariate analysis of variance test.

The results of the test were approved for homogeneity analysis of variance-covariance matrix (P = 0.595, F = 0.76). The Wilkes Lambda index was significant for the overall significance of the model (P = 0.001, F = 18.14). Table 2 reports the results of the comparison of the groups in each of the components. Considering that at this phase, three components of autism symptoms were analyzed as three dependent variables, in order to correct and optimize the significant differences in Bonferron correction. In other words, depending on the number of dependent variables, the significance level was considered as 0.05 ÷ 3 = 0.017. Table 3 shows that the difference in the groups in the post-test phase is only significant in the component of the stereotypical behaviors, meaning that the intervention was able to reduce the symptoms associated with the problems of the stereotypical and not those of communication and interactive behaviors in the experimental group. In overall, Figure 2 illustrates that the mean scores of all components have been reduced in the experimental group compared to the control group. Moreover, the communication and interactive behaviors components are less reduced in the experimental group compared to the other component (stereotypical behavior).

Table 1: Mean and standard deviation of autism symptoms in experimental and control groups

Phase	Group	Interactive behavior components	Communication behavior components	Stereotypical behavior components	Total score of scale
Pre-test	experimental	31.80±(2.96)	33.25±(2.31)	32.15±(3.53)	97.20±(8.80)
	control	33.95±(3.04)	33.80±(2.08)	30.40±(3.14)	98.15±(8.26)
	mean	32.87±(3.00)	33.52±(2.19)	31.27±(3.33)	97.66±(8.52)
Post-test	experimental	28.40±(4.15)	29.50±(2.03)	20.10±(3.24)	78.00±(9.42)
	control	33.70±(2.94)	32.95±(2.05)	30.25±(2.95)	96.90±(7.94)
	mean	31.05±(3.54)	31.22±(2.04)	25.17±(3.09)	87.44±(8.67)

Table 2: Results of covariance analysis of post-test scores in experimental and control groups

Sources of changes	Sum of squares	Degrees of freedom	The mean squares	F	Significance level	eta square	Statistical power
pre-test	559.41	1	558.41	24.89	0.001	0.589	0.986
group	3012.16	1	3013.22	132.93	0.001	0.891	1
error	379.10	17	21.98				
total	140357.03	20					

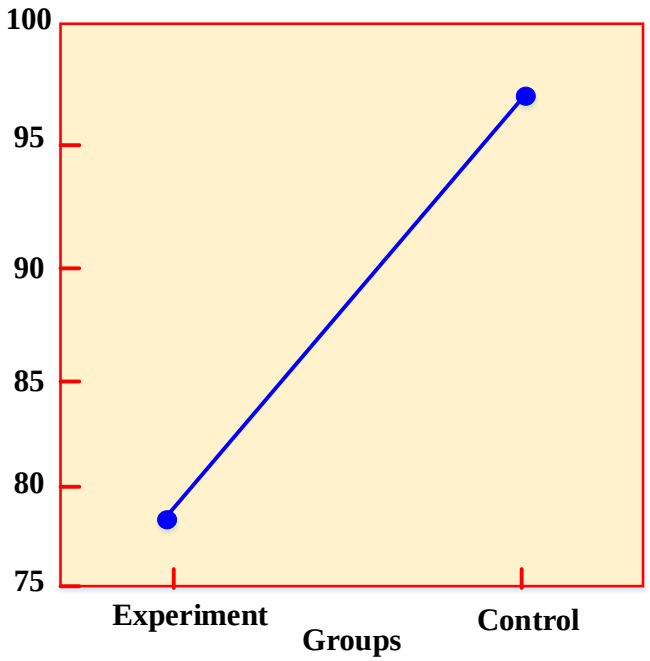

Figure 1: Comparison of the mean scores of the experimental and control groups for the autism symptoms in the post-test phase

Table 3: Comparison of the components of autism symptoms in the experimental and control group in the post-test phase

Sources of changes	Dependent variable	Sum of squares	Degrees of freedom	The mean squares	F	Significance level	eta Square	Statistical power
group	stereotypical behavior	426.13	1	512.15	41.23	0.001	0.701	1
	communication behavior	22.92	1	26.42	5.21	0.026	0.225	0.634
	interactive behavior	35.25	1	35.45	4.95	0.029	0.231	0.694
error	stereotypical behavior	224.72	18	13.41				
	communication behavior	69.54	18	5.45				
	interactive behavior	57.95	18	4.94				
total	stereotypical behavior	12385.01	20					
	communication behavior	17765.31	20					
	interactive behavior	15394.02	20					

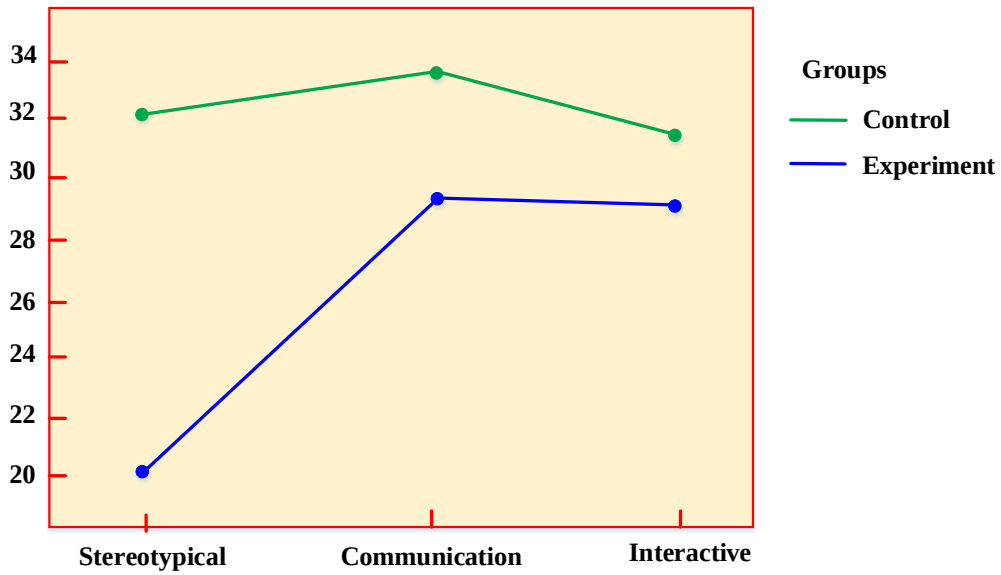

Figure 2: Comparison of the experimental and control groups for three components of autism symptoms in the post-test phase

4. Discussion

The results obtained from the mean and standard deviations of the data in the pre-test and post-test phases illustrated that the pre-test scores of experimental groups are approximately the same as the control groups. The mean difference between "post-test" and "pre-test" scores for the whole experimental group was 19.2 for the reduction in symptoms, and the mean difference in post-test and pre-test scores in the control group represented only 1.25 points reduction in the symptom score. Therefore, it can be argued that the therapeutic horseback riding over the course of 12 weeks produced a significant improvement in the experimental group, which is approximately 6.4 per month. It can be observed that the rate of recovery by therapeutic horseback riding for component of communication and interactive behaviors is lower than that for stereotypical behavior component.

The "pre-test" scores of the experimental group and comparing them with post-test scores (mean scores of "pre-test" and "post-test") represent 12.05 points of reduction in stereotypical behaviors. By considering the 19.2 total reduction scores for all three subscales (stereotypical, communication, and interactive behaviors), it can be concluded that the reduction of symptoms in the underlying group of stereotypical behaviors is greater than the other two subscales, which can be due to the sustainability of the behaviors that the child has undergone before the onset of the treatment. Meanwhile, because attempts to change stereotypical behavior discontinue or disrupt the curriculum, the trainers tried to reduce these behaviors and use their time mainly to increase interaction and communication (in fact, to create and strengthen the desired behaviors). However, the difference between the "pre-test" and "post-test" scores of the control group represents 0.1 point of reduction, which can be actually ignored, either in relation to the other two subscales or in relation to the 1.25 overall reduction score.

Examining the pre-test scores in the experimental group showed that from the total score of 97.2, the sub-group of stereotypical behaviors has 32.12 score which is about 33% of the scores, and the difference between the two means also represents the same percentage of reduction in symptoms. The pre-test and post-test scores of the control group also showed the same ratio and percentage, and their post-test scores indicated that no improvement has obtained in the control group.

The comparison of the mean scores of "pre-test" and "post-test" for the components of communication behaviors represents 3.75 and 0.85 scores of reduction in symptoms of the experimental and control groups, respectively. The same comparison of the mean scores of "pre-test" and "post-test" for the interactive behavior shows 3.4 and 0.25 scores reduction for symptoms of the experimental and control groups, respectively. These results indicated the low effect of therapeutic horseback riding on the components of communication interactive behaviors. The main finding of this study emphasizes the significant effect of the therapeutic horseback riding on the stereotypical behavior and slight effects on communication interactive behaviors.

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